COVER STORY

Tackling the Last Frontier

The rush is on to develop—and preserve—the Amazon

The river ran, a broad highway of molten gold, into the flaming sky; the far-off mountains loomed purple across the marshes; belts of rich green, the riverbanks stood out on either side against the rose hues of the rippling water; in front, as we forged steadily onward, hung the tropic night, dim and vast.

—Theodore Roosevelt, *Through the Brazilian Wilderness*

The wet squalls rise and cool as they collide with the mountains, building massive snow beds in the Peruvian Andes. When the snow melts, it becomes white water cascading off the towering slopes into the continental basin and carrying eroded mud and minerals on a meandering, 4,000-mile journey to the sea. From the vast upland forests of Colombia, Brazil and Venezuela, channels of black water—four miles wide and 200 ft. deep in some parts—join the main stream. Farther along, pristine blue and green waters come rushing down from the highlands of Surinam, Guyana, French Guiana and central Brazil. Pulsing and churning, roiling and eddying in a maelstrom of fluid colors, more than 1,000 tributaries merge into a single gargantuan tide that, at its gaping estuary, spills 6 million cu. ft. of water every second into the Atlantic Ocean, enough to color the sea a turgid brown more than 60 miles from the coast.

There is no place like it on earth. Indeed, for explorers like Theodore Roosevelt, who spent five months in 1913-14 blazing trails through its uncharted jungles, or Jacques-Yves Cousteau, who embarked on the "most complicated" voyage of his life in June, the mighty Amazon River is a mystical gateway to nature's last frontier. The lore of this awesome stream, infested with ferocious piranha and catfish large enough to gulp small children, surrounded by lush rain forests, with trees up to 150 ft. tall, stretching hundreds of miles, is also gilded by a lingering legend that this formidable landscape conceals phenomenal treasures.

In 1541, a Spanish expedition led by Francisco de Orellana sailed down the Amazon looking for the fabled kingdom of El Dorado.* Instead, Orellana and his men encountered what they took to be a tribe of warrior women, described as

*El Dorado, or "the gilded one," was a mythical king in South America whose body, according to legend, was dusted with gold each morning and rinsed each evening.

LOREN MCINTYRE

checking on whether the Algerians and the Bank of England are signing the escrow agreement."

A total of $7.977 billion of Iranian money [the $5.5 billion held overseas by the twelve U.S. banks plus $2.4 billion in frozen Federal Reserve accounts] would have to be in the Bank of England and ready to be transferred from our account there to the Algerian account, the last step before the hostages can be released. I tell Miller to be sure the Bank of England is ready with its certification of deposit, so we will have no further delay after the funds are in London.

4:38 a.m., from Christopher: "There is still a problem, and it is serious. Algiers will not accept *any* amendments proposed by the Federal Reserve lawyers unless they are first approved by Iran."

I tell Cutler: "Get Solomon, Christopher and the lawyers on the same line. I will use all the authority I have to get this resolved. We can use the escrow agreement, the written understandings and today's telex messages combined to cover any possible procedural problem. We can work out the remaining questions later." I eventually convince the Fed officials and attorneys that the package is adequate.

5 a.m.: Finally, Solomon tells his attorneys, "Sign it."

5:10 a.m., from Miller: "The Bank of England will have to check the deposit. It will take about 15 minutes."

5:20 a.m., from Miller: "It only took two seconds to transfer the money to London. Now all we need are three things: the signed escrow agreement, the certification of deposit from our account to the Algerian account, and for Algiers to notify Washington and Tehran that all agreements have been fulfilled."

6:05 a.m.: The Operations Center reports a message from Tehran control tower: "Line up Flight 133."

6:05 a.m., from Christopher: "All parties are now signing the escrow agreement. Iran has been informed. Benyahia states that the hostages will be moved out within an hour after notice from Algeria."

6:35 a.m., from Christopher: "All escrows were signed at 6:18 E.S.T. The Bank of England has certified that they hold $7.977 billion, the correct amount. Now the bank must send this certification to Algiers."

6:47 a.m., from Miller: "All the money is in the escrow account. The Bank of England will now certify this fact to Algiers."

I place a call to Governor Reagan to give him the good news, and am informed that he prefers not to be disturbed, but that he may call back later. I respond that I will call him when the hostages are released.

7:15 a.m., from Christopher: "Amounts are being checked off as received. The message to Iran will be sent within 15 minutes after the Bank of England completes its certification that the money is all there."

I reply: "Cy Vance's plane will be ready to depart Andrews Air Force Base when the hostages are airborne." I had asked Cy to welcome the hostages in Germany. He had already waited a long time at the airfield.

7:30 a.m.: I tell Miller to push the Bank of England. Its delay is inexcusable. The officials there just seem to be enjoying the limelight. "The Bank of England would have been faster if they had hired the Iranian telex operator!" I exclaim.

7:35 a.m.: Rosalynn comes in with my razor, followed by a barber. She says, "Jimmy, you have forgotten to shave, and you need a haircut." I go to the bathroom for a quick shave, and then the barber cuts my hair while I talk on the telephone.

7:55 a.m., from our Operations Center in Washington: "The planes are getting ready to take off." I am personally receiving reports on radio traffic almost halfway around the world—between the Tehran airport control tower and the three planes poised at the end of a runway.

The long-awaited message has come to me from the Operations Center through satellite and other relay stations. I shout, "Flight 133 is ready for takeoff!" The Oval Office is filled with cheers. Now we need only the final word from Algiers to Tehran.

Flight 133 consisted of three airplanes. Two were 727s, commercial passenger planes: one to bring out the American hostages and the other to serve as a backup or possible decoy. The third was a smaller corporate jet that would carry home the Algerian medical team that had examined the captive Americans.

8:18 a.m., from Christopher: "The bank certification was completed at 8:04. Algeria confirmed this at 8:06. They are now notifying Iran."

Our agreement with Algeria and Iran provides that when the Algerian central bank certifies that the required amount has been placed in the Algerian escrow account, "Iran shall immediately bring about the safe departure of the 52 U.S. nationals detained in Iran."

I tell Operations Center: "I want a report on takeoff and also when our people have cleared Iranian airspace."

8:28 a.m., from Operations Center: "The planes are now standing at the end of the runway. One Iranian F-4 [fighter plane] is active. May be escort."

I then get a series of reports about escort planes orbiting the airport and a jeep checking the runway. I confirm the serial numbers of the two 727s to be sure they are the right ones. (Having dealt with the Iranian officials for many months, we were not surprised when they delayed the takeoff, for no apparent rational purpose.)

9:45 a.m., from Christopher: "Takeoff is not imminent, but I can state for certain that it will be before noon. Iran asks Algeria not to announce departure until after the planes clear Iranian airspace."

I answer, "We will try to comply."

10:45 a.m., from Rosalynn: "Jimmy, the Reagans will be here in 15 minutes. You will have to put on your morning clothes and greet them."

Free at Last

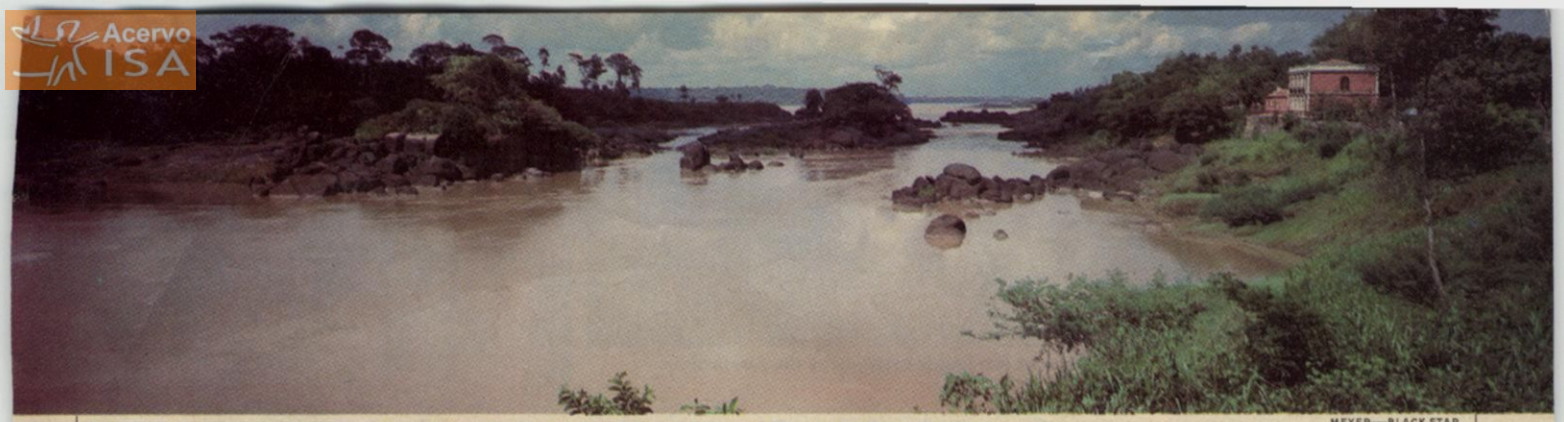
I left the Oval Office reluctantly, after making arrangements to be kept informed about every development, and walked rapidly over to my private quarters in the White House. As I put on my rented formal suit, I was able to transfer my thoughts for the first time to the Washington ceremonies now about to begin. They seemed like a dream; reality was in the Oval Office, Algiers and Iran.

I combed my hair in the President's bathroom, a convenient cubicle with rows of electrical outlets installed when Lyndon Johnson once found electrical devices plugged into all the existing ones. As I looked at myself in the mirror, I wondered if I had aged so much as President or was just exhausted. As I rode to the Capitol and sat through the Inaugural ceremonies, the hostages were always on my mind. I still had no assurance that my efforts would be successful, and no way to know that this would soon become one of my happiest days, even happier than that day exactly four years earlier when President Gerald Ford had greeted me on the way to my own Inauguration.

Less than two hours later, I was notified through Secret Service radios that at 12:33 p.m. the first aircraft had been allowed to take off; nine minutes later the other had followed. I was no longer President of the U.S. The hostages were free.

It is impossible for me to put into words how much the hostages had come to mean to me, or how moved I was that morning to know they were coming home. At the same time, I was leaving the home I'd known for four years, too soon for all I had hoped to accomplish.

I was overwhelmed with happiness, but because of the hostages' freedom, not mine. ■



North channel of the Amazon near its mouth, left; a bend in the Jiparaná River: no place like it on earth

MEYER—BLACK STAR

"very robust, with bows and arrows in their hands, each doing as much fighting as ten Indian men." The startled Spaniards associated the female warriors with the fierce Amazons of classical mythology and named the great river after them.

More than four centuries later, the magical allure of an El Dorado shrouded by murky rivers and thick jungle still endures. The government of Brazil is convinced that one golden path to prosperity lies in harnessing the mammoth resources of the 2.7 million sq. mi. of the Amazon basin. The bulk of that territory is in northern Brazil, but it also stretches across parts of Bolivia, Colombia, Ecuador, Guyana, French Guiana, Surinam, Peru and Venezuela. The potential wealth is no chimera: the Amazon region is known to contain the planet's largest stands of timber and deposits of iron, as well as uncounted fortunes in tin, bauxite and manganese, and possibly the world's biggest store of gold.

Yet to many ecologists the Amazon's most precious treasure is its intricate interplay of water, plant and animal. The region is an undisputed miracle of nature, generating 23% of the earth's surface fresh water and unknown quantities of its oxygen. Careless exploitation of the Amazon, environmental experts warn, could cause irreparable damage to the global ecological balance.

Brazil, however, faces grave economic problems. By the end of June the country had piled up $71 billion in foreign debt, the world's largest on a per capita basis and second in absolute terms only to Mexico's ($80 billion). Brazil also has a burgeoning population (122 million) and rampant inflation (98%). At the moment only 2% of Brazil's gross national product of $280 billion is derived from the Amazon, and Brazilians are embracing an old slogan with new urgency: THE AMAZON IS NOT A PROBLEM. IT IS A SOLUTION.

The dilemma facing Brazil and the rest of the world is one of the more per-

Cars, bicycles and carts mingle in the frontier town of Jiparaná: "A land without men for men without land"

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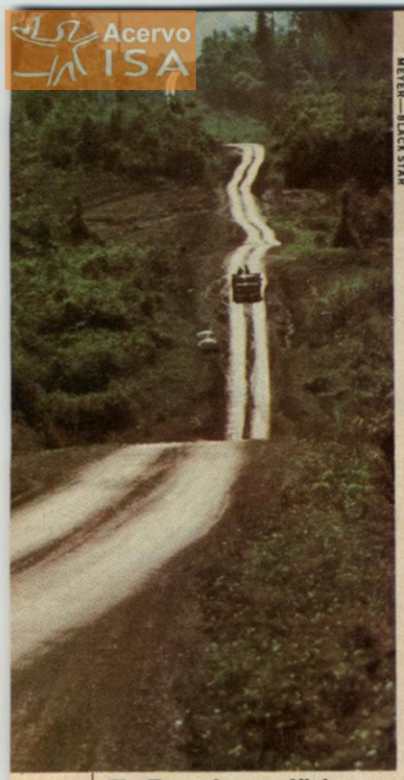

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The Trans-Amazon Highway

HORAN—PICTURE GROUP

Trees smolder in a jungle clearing at the Jari project

MEYER—BLACK STAR

Harvested logs floating down the Rio Negro

Working tin slurry at a mine in Rondônia

plexing conflicts between rich and poor nations: how to fulfill one country's aspirations for economic development while preserving a vital part of the earth's environment. Many Brazilians perceive international campaigns to shield the Amazon's ecology from torch and bulldozer as a form of imperialism. The underlying goal, as they see it, is to prevent their country from tapping the jungle's largesse and thus protect future access to those riches for foreign enterprises. As a result, a nationalistic zeal now infects Brazilians concerning what they proudly, and perhaps correctly, call "the last frontier." Says Adeildo Martins de Lucena, editor of *Correio do Sul*, a newspaper in the Amazon town of Vilhena: "The Amazon is not the lungs of humanity. We have the same right to destroy our wilderness as the Americans had in the Far West."

Right or wrong, man's encroachment on the Amazon is accelerating, and nowhere more than in Rondônia, a fertile area to the southwest of the basin. Fleeing the crowded and depleted agricultural land of the south or the drought-stricken farms of the northeast, impoverished families are migrating in droves to seek new lives and perhaps strike it rich in the vast jungle. They pile their belongings on creaking flat-bed trucks called *pau de araras* (parrot perches) and bump along Highway BR-364, the dirt road that leads to Rondônia's virgin forests. Some 57,000 new settlers arrive each month. Rondônia, named after Cândido Mariano da Silva Rondon, a legendary Brazilian army officer, jungle explorer and humanitarian, now expects to double its population to 1.3 million by the end of next year. It became Brazil's 23rd state in December. As former President Emílio Garrastazú Médici once said, Rondônia is "a land without men for men without land."

Most of the settlers who flock to dusty towns such as Pôrto Velho and Vilhena seem prepared for jungle hardships and often carry enough bags of rice, beans, sugar and coffee to last for an entire year. They dream of ending up like, say, Luís Bernardi, 36, a former truck driver from São Paulo who in 14 years has amassed a fortune in real estate and retail stores. He owns an eight-room house, a country estate and 740 valuable acres in Jiparaná, a rugged frontier outpost, where land-grabbing feuds a decade ago inspired a murder a day. "The wild times are gone now, and I have no enemies around," says Bernardi. "I'm thought to be a humble person. You have enemies when you are very ambitious."

Nonetheless, just as in the days of America's wild West, violent quarrels persist over land titles in Rondônia. Many of the clashes have occurred over the creation of cattle ranches and large plantations. Families of *posseiros* (squatters) cultivating a few acres are evicted by *gatos* (wildcats) who employ migrant workers to clear the rain forest, build trails and erect barbed-wire fences on behalf of the *grupos fortes*, the powerful groups of absentee landowners who remain in São Paulo. Lately many of the settlers have begun to battle back against the landowners and their hired gunmen.

"Many think they have been abandoned by the government," says a newspaper reporter in Cerejeiras, another Am-

Shoppers inspect the river's bounty at a fish-and-produce market in Belém

MEYER—BLACK STAR

Manaus' opera house, crowning glory of the boom years

ANGEL—WHEELER PICTURES

azon town. "Without any other means of survival, they are determined to take justice into their hands as a last resort to defend their farms." The three-year-old military government of President João Baptista Figueiredo staunchly supports Amazon immigration and encourages settlers with free land. The government is counting on the rush to Rondônia to shift unemployed rural farm workers onto arable land.

Brasília's main imperative is to stock the Amazon with people who can manage and operate the massive development projects that have sprouted up there in recent years. Besides offering lucrative tax advantages to large private business enterprises the Figueiredo government has poured an estimated $20 billion into Amazon development since 1979, including the construction of mineral processing plants and timber mills around eleven industrial centers scattered throughout the river basin. The enormous development costs have raised bankers' fears about the country's horrendous debt, but politicians endorse the investment with patriotic fervor. "Opening up Amazonia is our moon shot," said a Brazilian senator several years ago. "It lacks only capital, technology and a spirit of enterprise and, above all, people."

Brazil's ambitious plans for the Amazon, however, have long worried ecologists, who contend that disrupting the fragile life cycle of the rain forest could have disastrous effects around the world. As developers continue to burn and raze vast swatches of the Amazon forest, scientists are warning about three dangerous consequences:

Desertification. Half of the Amazon basin's rainfall is generated by the forest. Where large patches of trees are cut, rainfall is reduced and erosion rises dramatically. Scientists maintain that if too much of the forest is lost, more solar heat will be reflected from the bare soil, leading to changes in air circulation, wind currents and weather patterns. "When you replace the rain forest with something that has less leaf surface, you have less transpiration [the exuding of water vapor], less rainfall and thus a dryer climate," explains Thomas Lovejoy, vice president for science at the World Wildlife Fund (U.S.). "If too much forest is lost, at some point there will be an irreversible drying trend." Lovejoy and other scientists believe that such a drying trend could drastically alter the remaining Amazon forest and possibly inflict severe climatic changes far beyond the tropics. A dryer, warmer climate in the equatorial zone, for example, would tend to push the temperate zone northward, thereby shifting the grain-growing belts in the U.S. and Canada.

Carbon Buildup. Tropical forests contain enormous quantities of stored carbon. The steady burning of fuels such as oil and wood has greatly increased the carbon dioxide in the atmosphere. To clear immense tracts of the Amazon jungle, developers have set fires that produced so much smoke that airports 100 miles away were forced to shut down due to lack of visibility. Future deforestation of the Amazon could magnify the atmospheric accumulations of carbon dioxide, causing warmer climates through what is known as the greenhouse effect. Much like the windowpanes of a greenhouse, carbon dioxide traps the sun's radiated heat in the earth's atmosphere. Says Lovejoy: "A global

Charting the River of Life

French Oceanographer Jacques-Yves Cousteau, the world's best-known sea explorer, embarked last June on a nine-month journey up the Amazon River, an undertaking that he describes as his "most complicated and important expedition." TIME's *South America bureau chief, Gavin Scott, visited Cousteau aboard his expedition vessel, the 360-ton converted mine-sweeper* Calypso, *near Iquitos, on the upper reaches of the Amazon in Peru, for a firsthand account of how the scientific cruise is faring. Scott's report:*

The helicopter clattered through the steamy sky, skipping over a series of shantytowns that dotted the lush landscape before homing in on the white-hulled vessel anchored in midstream. The gaunt 72-year-old captain could barely conceal his enthusiasm as he proudly gave his visitor a tour of *Calypso*. "We've got the state of the art," said Cousteau, as he waved his arm toward a wheelhouse crammed with electronic gear. The equipment seemed capable of launching an interplanetary missile: two radar systems, a gyrocompass, satellite-navigation equipment, an echo sounder, a sight-scan sonar and a projection microscope.

Cousteau's 4,000-mile exploration will require every bit of that technology and more: the $5 million project, financed by U.S. Entrepreneur Ted Turner, *National Geographic* magazine and members of the Cousteau Society in America, is one of the most ambitious studies ever undertaken of the Amazon. "This is the first time there will be a global picture of the river from its source in the high Andes mountains of Peru to the estuary flowing out into the Atlantic," Cousteau explained. The expedition will survey not only the Amazon but also its main tributaries and nearby lakes, while a "land team," headed by Cousteau's son Jean-Michel, studies the relationship of river inhabitants and the jungle to the water system.

Cousteau says that his main purpose is to form "a continuous profile of the water quality of the Amazon; its salinity, oxygen content and everything connected with aquatic life." In the first four months of the study, thousands of water samples have been extracted. Each day Cousteau's team produces computerized print-outs of temperature, salinity and water transparency. The murkiness of the river has made photography difficult for Cousteau's divers, but sonar readings are providing fascinating glimpses of teeming underwater life. "One of the surprises has been that the fish talk all day long," says Cousteau. "It is like daybreak in the forest, as the sounds come over the hydrophones."

COUSTEAU SOCIETY

Cousteau, left, and colleagues explore the jungle near Manaus

Asked his views on the destruction of large areas of the Amazon basin by man, Cousteau refuses to criticize the governments of the area for environmental damage. A compromise, he says, should be found between conservationist demands to halt further exploitation and developing nations' needs to tap the river and the jungle for resources. Explains Cousteau: "It is easy to say 'Do not pollute, do not cut down that tree,' when you have a steak and a beer."

warming trend could raise temperatures at the poles and cause sea levels to rise enough to inundate coastal areas around the world."

Species Extinction. The least dramatic but most tragic effect could be the loss of species and genetic diversity. Of an estimated 5 million to 10 million plant, insect and animal species in the world, 1 million are located in the Amazon basin. The river contains more than 2,500 species of fish, ten times the variety found in the Mississippi River. This abundant array of wildlife and vegetation is sustained by fascinating forms of collaboration and adaptation. The senna tree, for example, yields a yellow-and-brown flower, which plays host to a spider whose yellow and brown spots provide perfect camouflage; the spider feeds on insects lured by the scent of nectar, thus shielding the flower from its enemies. Leaf-cutter ants use scissor-like jaws to carve bits of leaf that they carry back to their nests and infect with a fungus, which they then eat. Since the river water is relatively free of nutrients, some varieties of fish survive by swimming through forest flood plains, gorging on seeds, fruit and insects to build up a fat supply on which they can live during the lean months when the waters recede.

Such species are highly vulnerable to man's efforts to clear the jungle. Ghillean Prance, senior vice president for science at the New York Botanical Garden, charges that about 20% of the Amazon basin has been deforested and that a decline in species has already begun. "Our survival depends on diversity," says Prance. "The world today is fed by fewer than 20 major food crops. If one of these is extensively damaged by pests or disease, part of the world faces famine." He insists that it is vital to maintain a gene pool from which to develop new species and that the Amazon is the most prolific source. Only one species of cocoa plant, for example, is now harvested commercially, while 20 others are known to thrive in the Amazonian forests. Similarly, man taps only two species of the rubber plant, but there are 13 others growing wild in the jungle. In addition, the Amazon has unknown numbers of plants that may have important pharmaceutical uses. "This is a crucial moment," warns Prance. "We have to learn as much as possible now before more species are destroyed forever."

Brazilian officials dismiss Prance's fears and contend that only 1% of Amazon tree cover has been lost. Nonetheless, President Figueiredo has adopted a more solicitous approach than his predecessors toward preserving the Amazon environment. After taking office in 1979, he decreed that "future development of Amazonia must stress the need to preserve ecological equilibrium to which protected areas of the forest are indispensable." His government is trying to create legislation that would provide sanctuary for 800,000 sq. mi. of parks, reserves and forests in about 20 sites. In addition, small-scale landholders are now required to maintain half of the land they buy in its natural state, a stipulation that is often honored in the breach.

Brazil's current policy stems not only from sudden alarm about the fate of the Amazon's ecosystem but also from a chastening failure in past efforts to transform parts of the jungle into cattle ranches and grain farms. Despite the Amazon's profuse foliage, 98% of the soil is too poor to support agriculture. Betty Meggers, an anthropologist at Washington's Smithsonian Institution, calls the Amazon "a counterfeit paradise" whose "fantastic complexity, infinite diversity and marvelous integration" obscure what is basically "a castle built on sand."

The Amazon's rain forest flourishes in spite of poor soils, not because of them. A spreading mat of roots covers the jungle floor, absorbing nutrients from decomposed matter and tepid rain water that drips from the forest canopy. Bacteria and fungi in that tropical climate require only six weeks to decompose fallen leaves, branches and fruit, far less than the year needed in more temperate zones. The jungle's rapid metabolism provides no opportunity for the ground to evolve into fecund loam. When cleared of vegetation, the Amazon's soil bakes as hard as brick under the hot equatorial sun.

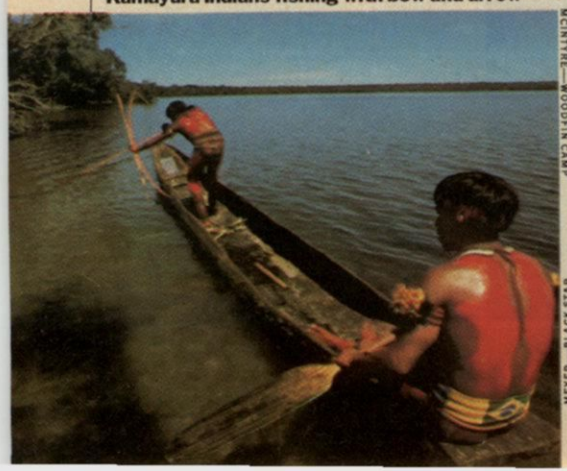
When famine threatened northeastern Brazil following prolonged drought, the government decided in 1970 to build the Trans-Amazon Highway to encourage cultivation of the Amazon as a "breadbasket" for the nation. Huge sections of the rain forest were cleared to make way for cereal farms, timber projects and cattle ranches. The schemes failed miserably. Initial harvests proved satisfactory because the ash of burned forests provided enough nutrients for the grass and grain. But by the third year, nutrients were exhausted, and the soil grew unproductive. "Rice was seen as a panacea in the early 1970s, but turned into an economic debacle," says Dennis Mahar, a World Bank economist. "Since rice could not be sustained on the same plot for more than one or two years, it caused more deforestation than any other crop." Similarly, grass intended for cattle grazing yielded little more than scrub within two years.

Lumbermen too discovered that the jungle resisted conventional forestry techniques. The Amazon's evolution has encouraged diverse growth, with trees of any single species dispersed to inhibit the

Settlers in the doorway of their frontier home

MEYER—BLACK STAR

Kamayurá Indians fishing with bow and arrow



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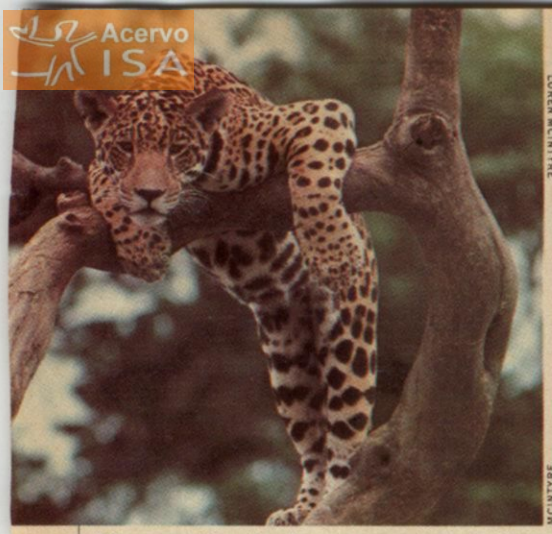
After migrating from southern Brazil, a family unloads its possessions in Rondônia



A jaguar relaxes in a tree

Egrets wade along the riverbank: an intricate interplay of plant, water and animal

spread of disease and predatory insects. Rubber trees, for example, usually grow 50 yds. apart in the Amazon. Their chief enemy, a minute spore that gives rise to leaf-rust fungus, rarely travels more than 30 yds. Consequently, timber merchants find no uniform swatches of mahogany or teak ready to cut and haul away. They must forage through a baffling assortment of trees before locating the kind they want to chop down. "The Amazon is a biologist's dream but a forester's nightmare," says Lovejoy. "Imagine trying to manage a twelve-acre patch with 300 species on it."

The Amazon possesses another formidable defense against man's invasions: tropical disease. One of the world's highest incidences of leprosy occurs in the southwestern Amazon. In Rondônia, 10% of the population is said to be afflicted with malaria. Parasites usually carried by sand flies and wild animals cause a host of hideous ailments, like leishmaniasis, a kind of skin disease that causes deep sores in the lining of the nose and mouth.

The Amazon's awesome qualities owe much to its unusual past. About 165 million years ago, the continents of Africa and South America were united as part of a huge landmass called Gondwanaland. When the land split apart, the South American fragment began to drift slowly westward. About 15 million years ago, it collided with an underwater segment of the earth's crust, a plate that was part of the Pacific Ocean floor. The impact plunged the edge of the Pacific plate beneath the western coast of South America, and the Andes Mountains rose up, allowing the formation of a great inland sea between the Andes and highlands to the east known as the Brazilian and Guyana shields.

Ultimately, that body of water penetrated the eastern hills at a point called Obidos Narrows, not far from the present-day city of Santarém. The Amazon settled into its modern geological pattern about 10 million years ago, but shifts in climate drastically altered the face of the great rain forest. "During the ice age, the Amazon was a lot dryer and temperatures were lower, so the tropical jungle shrank, leaving pockets of forest amid the savanna," says Prance. While the jungle was divided into these islands, each patch developed new species of its own. "When the ice age ended [about 10,000 years ago], the forest merged once again, but with a greater number of species than before."

Mankind first arrived in the region about 22,000 years ago and spent most of the subsequent millenniums in harmony with the jungle. Only the latecomers have tried, foolishly, to subdue it. A succession of European seafarers and traders in the late 16th and early 17th centuries sought to organize "the Western Indies" and cultivate sugar plantations in the Amazon, but many of them were forced to return home, often haggard, feverish and bankrupted by the jungle experience.

Then, in the 19th century, Brazil's merchants discovered something better than gold: *Havea brasiliensis*, the rubber tree. Waterproof shoes, buckets, pouches and pillows were produced from the elastic extract, and when John Dunlop patented the pneumatic tire in 1888, the rubber boom exploded. Indians were enslaved to tap the trees and haul the precious cargo aboard ocean freighters that made the seven-day cruise up the Amazon to the frontier port of Manaus. As rubber prices soared from 10¢ to $3 per lb., Manaus (pop. 50,000 at its zenith) became one of the wealthiest cities in the world.

The rubber barons who amassed overnight fortunes decided to transform their roughneck outpost into a "Paris of the tropics." Elegant squares and mansions adorned with Italian marble and French furnishings were set down on the fringe of the jungle. Children reportedly played with toys of gold, men lit cigars with 100-milréis notes ($54), and silk shirts were blithely dispatched to Europe to be laundered. For a while, Manaus was the world's biggest diamond market.

The pearl of Manaus' prosperity was a lavish opera house called Teatro Amazonas. The domed rococo theater opened in 1896 after 17 years under construction. Top European artists were commissioned to paint the murals. Opera troupes from the Old World, offered five times what they earned back home, ventured to the cultural oasis overlooking the jungle port.

When the bubble finally burst, the city's decline was equally spectacular. In 1876, an English visitor to the Amazon, Sir Henry Wickham, carried out 70,000 rubber seeds and later transplanted them in Sri Lanka, Java, Singapore and Malaysia. By 1910, news arrived in Manaus of the first rubber harvests in Asia, and the efficient producers in the Far East quickly undercut the Brazilians. By 1912 prices for latex had tumbled disastrously. The extravagant life of Manaus was reclaimed by the jungle; the opera house was reduced to showing plays and movies; the marble mansions were soon swarming with lizards and bats; and the pioneers of the rubber boom sailed back to Europe.

A piranha smiles toothily for the camera

Titanus giganteus, an Amazon-size beetle

But the city survived, and even enjoyed a brief renaissance during World War II. In an effort to promote investment, the government declared Manaus a free zone in 1967. In this less lurid incarnation, the city has become a mecca for tourists seeking low-cost watches, radios and electronic gadgets (most of them locally assembled from imported parts). If modern Manaus (pop. 380,000) is a pale reflection of its past, it remains the last haven of civilization on

the road west into the Amazon jungles.

The rubber experience left evil scars on the Amazon. Thousands of trees were destroyed in the lust for quick yields. Food crops were abandoned. Worst of all, the human exploitation nearly devastated the Indian populations in the jungle. A British investigation into rubber collection in the Amazon's Putumayo region determined that the 4,000 tons of rubber produced there from 1900 to 1911 cost about 30,000 lives. Native Indians enslaved by traders were subjected to wanton atrocities, charged a British official at the time, such as "flogging, torturing, burning and starving to death . . . surpassing in horror anything hitherto reported to the civilized world during the last century." In this century alone, 90 tribes are reported to have become extinct, and another 24 are considered in serious jeopardy. Brazil's recent attempts to protect the Indians through special legislation may be too late. Between 5 million and 6 million of them once lived in the Amazon basin; today there are as few as 200,000.

Despite the end of the rubber boom and the discovery of its attendant cruelties, the romantic appeal of the Amazon did not die. The U.S. automobile tycoon Henry Ford wanted to control his firm's access to rubber supplies, so in the mid-1920s he decided to grow his own. He acquired close to 2.5 million acres about 100 miles south of Santarém and set up a plantation colony called Fordlândia. An entire community, including hospitals, a power station, a private railway and housing for 3,000 workers, was carved out of the virgin jungle. Young rubber trees bred in Java and Sumatra were transported to Brazil, where they would gestate for seven years before the latex would flow.

But Ford failed to heed the jungle's laws. Leaf-rust fungus ravaged most of the trees because they were planted too close together. Undaunted, Ford chose another site and tried again, only to have the entire venture collapse with another decline in rubber prices after World War II and a rise in the use of synthetic rubber. In late

Mining a Modern El Dorado

In 1967 a Brazilian geologist working for U.S. Steel Corp. was conducting a survey in the southeastern Amazon when his helicopter was forced down by mechanical trouble. The aircraft landed in a clearing, a curiously bare patch in the endless green tapestry of jungle. Upon closer inspection, the plot and similar ones near by turned out to contain an iron-rich crust called *canga*. After surveying the area, geologists discovered that they had stumbled upon one of the world's largest lodes of mineral wealth: an estimated 18 billion tons of open-pit minable iron ore, 14.5 million tons of bauxite, 1.2 billion tons of copper, 6 million tons of manganese and some gold.

Thirteen years later, the mineral bonanza in the Serra dos Carajás, 340 miles south of Belém, has become the focal point for what Brazilians proudly describe as "the project of the century." The Companhia Vale do Rio Doce (CVRD), a corporation owned on a 2-to-1 basis by the Brazilian government and 35,000 private shareholders, has been entrusted with the challenge of opening up the great iron-ore find. Even foreign observers are impressed with the range and depth of opportunities at Carajás. Says Canadian Ecologist Robert Goodland, an expert on the Amazon basin who works for the World Bank: "If there is an El Dorado, this must be it."

The industrial potential of the region is considered to be virtually limitless because the mineral-laden Carajás hills are near the Tucuruí hydroelectric project on the Tocantins River. The Tucuruí power plant (which will start operating in 1984) should generate 7,900 MW of electricity, enough to supply a city of 4 million people. "Carajás is the most exciting development project we have," says World Bank Economist Dennis Mahar. "The region already forms a kind of industrial pole."

Though the Carajás iron-ore project is still far from being what CVRD Financial Director Samir Zraick calls "an integrated system of mine-railway-port," mining has got under way. Huge electric shovels rumble across open-pit mines, scooping up red earth and dumping it into trucks that wind their way along hilly roads to processing units three-quarters of a mile away. Since the ore has a high natural iron content (an average of 66%), it requires little treatment before shipment. By 1987 Carajás will yield 35 million tons of ore a year, with production scheduled to increase to 50 million tons annually later. CVRD expects to earn as much as $20 billion over the first decade of production.

But Carajás has also attracted a growing number of critics as the world recession bites deeper. Some Brazilians, including opposition political parties, scientists and even some members of the military, argue that the government should not be investing billions of dollars in such a massive project at a time of increasing debts and slumping commodity prices. Brasília's economic planners, however, expect that world steel output will begin to rise again in 1985, thus spawning demand for high-grade iron ore. Moreover, the government claims that exploiting nonferrous metals can benefit Brazil even if export markets are bleak right now. In 1980 Brazil spent more than $500 million on copper, nickel, bauxite and manganese imports; that foreign exchange could be saved when Carajás begins to yield its riches.

The government maintains that once the project is completed, more than a million jobs will have been created, and Brazil will gain more than $15 billion a year in foreign exchange, along with accompanying agricultural, cattle ranching and forestry development. If that forecast proves to be true, Carajás may well be worth the total estimated development price tag of $60 billion, largely to be financed by foreign loans and private investment, both from home and abroad. Most encouraging of all, Carajás seems to reflect a new determination to harness the Amazon's resources without spoiling the jungle's delicate ecology: a task force of independent scientists has been set up to advise the CVRD on conservation measures.

MEYER—BLACK STAR

Iron-ore mining site at Carajás, one of the world's most exciting development projects

1945, after pouring more than $20 million into his Amazon rubber dream, Ford sold off his holdings to the Brazilian government for $250,000.

Other magnates have been lured to the Amazon by vain dreams of wealth and glory. U.S. Shipping Executive Daniel Ludwig purchased a Connecticut-size tract of jungle (4 million acres) for $3 million in 1967. He launched a timber, woodpulp and agriculture project at Jari, about 250 miles west of Belém, that dwarfed Ford's rubber plantation. A $269 million pulp mill 17 stories high (with its own power plant) was built in Japan and floated on barges across two oceans and up the Amazon to Jari. Twenty-six hundred miles of road and a 45-mile freight railway were laid down to haul lumber and kaolin, a clay used to coat printing paper, out of the rain forest to the deepwater port. More than 250,000 acres were stripped to plant gmelina, pine and eucalyptus trees that would be processed into paper products. Ludwig invested nearly $1 billion in his mammoth creation, perhaps the most costly entrepreneurial scheme ever undertaken by one man.

A sprawling community of 30,000—migrant laborers and well-paid American and Brazilian executives—came to live and work in Jari, seeking to transform Ludwig's fantasy into reality. But the jungle soon began to retaliate. Torrential rains, up to 100 in. a year at Jari, washed out roads when the tree cover was cleared. Ants and termites destroyed crops and supplies. Malaria and meningitis plagued the work teams. Giant bulldozers, brought in to raze the jungle, damaged the delicate topsoil so badly that many of the gmelina seedlings, which were expected to grow a foot a month, quickly died. Wrote Elio Gaspari, a guest columnist for the Rio de Janeiro daily *Jornal do Brasil:* "He [Ludwig] was cursed."

Ludwig's abrupt manner exacerbated Brazilian suspicions about foreign control of the Amazon. When he threatened to shut down Jari unless he received some aid to defray the expense of building an infrastructure for the project, the government snubbed him. Bureaucratic snags caused Ludwig more annoyance; authorities never legalized his title to more than half the land he had bought. Finally, 84 years old and in failing health, Ludwig abandoned his dream in disgust. More than a score of Brazilian companies, acting at the behest of the government, agreed in January to raise $280 million over the next three years to buy out Jari.

Ludwig's ill-fated adventure reinforced two lessons of the past: that man's efforts to tame the Amazon can prove counterproductive, and that he should adapt to the jungle, not alter it. "The only people who really understand the Amazon are the Indians," says James Fish, the U.S. consular agent in Manaus. "Entrepreneurs from outside come in here thinking all you have to do is send in a few bulldozers and magic will happen. Somehow they are surprised when, at the hotel, they get word back from the jungle that their bulldozers have disappeared—not stolen, but just disappeared."

A healthier respect for the Amazon's arduous nature has subdued the once headlong pace of Brazil's development program. A pioneering spirit still prevails in fertile oases like Rondônia and Acre, but many Brazilians now realize that respecting the jungle's fragile environment is the only way to make investments pay off. "The most important clue in how to deal with Amazonia leaps out at you from all those failed projects, noble in concept yet ridiculous in execution," muses the Brazilian novelist Márcio Souza *(The Emperor of the Amazon).* "To gain profit from the Amazon, you have got to think of a time scale of at least 100 years."

Francisco de Orellana, the river's discoverer

Theodore Roosevelt, center, during his 1913-14 Amazon expedition

At its estuary, the river disgorges 6 million cu. ft. per sec.

After the rubber bust, the Ford failure, the Ludwig debacle and the farming setbacks of the 1970s, Brazil is now concentrating on two kinds of Amazon development: mineral resources and selective forestry. The government will seek more than $60 billion to be invested in opening up a lode of minerals in the Carajás hills 340 miles southwest of Belém. The forested range contains an estimated 18 billion tons of iron ore as well as other key minerals.

Despite the Amazon's delicate ecological balance, most scientists agree that the region should be developed—but rationally, and on a more modest scale than in the past. "We cannot make the Amazon a living museum," says Richard Schultes, a botanist at Harvard University. "It has to be developed because man must live too." Nonetheless, Schultes and other Amazon experts believe that too much emphasis has been placed on huge schemes that carry unacceptable environmental and economic risks.

Developing the Amazon's rich resources is not incompatible with conservation efforts. Man, however, must tune his farming methods to the life cycle of the rain forest. "There is no hope at all for modern mechanized agriculture in a place like the Amazon," contends Schultes. He advocates cultivation of plants that do not require the removal of the tree cover, which protects the soil. He believes that peach palm and brazil nuts could be grown as well as cash crops like cocoa, coffee and cassava, which already thrive in the region.

A greater awareness of the Amazon's complex role in the world ecology has encouraged governments to heed warnings by scientists about the fragility of the gigantic basin. Scientists are sounding more optimistic that the rain forest will survive and continue to sustain abundant and diverse wildlife. "During the 1960s and 1970s things looked bad for the Amazon," says Lovejoy, "but now attitudes have changed." Indeed, after centuries of greed and rapacity, a consensus is growing among Brazilians and foreigners that no El Dorado, however promising, is worth the risk of jeopardizing a precious part of the world so vital to life itself.

—By William Drozdiak. Reported by Naushad S. Mehta/New York and Gavin Scott/Manaus